

What is claimed is:

1. An isolated nucleic acid molecule selected from the group consisting of:
 - (a) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, and SEQ ID NO:21 or a homolog thereof, wherein said homolog has an at least 50 contiguous nucleotide region identical in sequence to a 50 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, and SEQ ID NO:21;
- 10 (b) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37;
- 20 (c) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:49;

NO:50, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and

5 SEQ ID NO:50;

(d) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region

10 identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59;

(e) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62;

15 (f) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71, or a homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence

selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71;

(g) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID

5 NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79, or a homolog thereof, wherein said homolog has an at least 35 contiguous nucleotide region identical in sequence to a 35 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79;

10 (h) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID

NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87, or a homolog thereof,

wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from

15 the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87;

(i) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID

NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID

20 NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106, or a homolog thereof, wherein said homolog has an at least 15 contiguous nucleotide region identical in sequence to a 15 contiguous nucleotide region of a nucleic acid sequence selected from the group

consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106;

5 (j) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:107, SEQ ID NO:109, SEQ ID NO:110, SEQ ID NO:112, SEQ ID NO:113, SEQ ID NO:115, SEQ ID NO:116, SEQ ID NO:118, SEQ ID NO:155, SEQ ID NO:157, SEQ ID NO:158, SEQ ID NO:160, SEQ ID NO:161, SEQ ID NO:163, SEQ ID NO:164, SEQ ID NO:166, SEQ ID NO:167, SEQ ID 10 NO:169, SEQ ID NO:170, and SEQ ID NO:172; and

(k) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:119, SEQ ID NO:121, SEQ ID NO:122, SEQ ID NO:123, SEQ ID NO:124, and SEQ ID NO:126.

2. The nucleic acid molecule of Claim 1,
15 wherein a said nucleic acid molecule as set forth in (a) comprises a nucleic acid sequence that encodes a canine IL-4 protein;

wherein a said nucleic acid molecule as set forth in (b) comprises a nucleic acid sequence that encodes a canine Flt-3 ligand protein;

wherein a said nucleic acid molecule as set forth in (c) comprises a nucleic acid 20 sequence that encodes a feline Flt-3 ligand protein;

wherein a said nucleic acid molecule as set forth in (d) comprises a nucleic acid sequence that encodes a canine CD40 protein;

wherein a said nucleic acid molecule as set forth in (e) comprises a nucleic acid sequence that encodes a feline CD40 protein;

wherein a said nucleic acid molecule as set forth in (f) comprises a nucleic acid sequence that encodes a canine CD154 protein;

5 wherein a said nucleic acid molecule as set forth in (g) comprises a nucleic acid sequence that encodes a feline CD154 protein;

 wherein a said nucleic acid molecule as set forth in (h) comprises a nucleic acid sequence that encodes a canine IL-5 protein;

10 wherein a said nucleic acid molecule as set forth in (i) comprises a nucleic acid molecule that encodes a canine IL-13 protein;

 wherein a said nucleic acid molecule as set forth in (j) consists of a nucleic acid molecule that encodes a feline interferon alpha protein; and

 wherein a said nucleic acid molecule as set forth in (k) consists of a nucleic acid molecule that encodes a feline GM-CSF.

15 3. The nucleic acid molecule of Claim 1,

 wherein said nucleic acid molecule of (a) encodes a protein that elicits an immune response against an IL-4 protein having an amino acid sequence selected from the group consisting of SEQ ID NO:2, and SEQ ID NO:20, or a protein that has IL-4 activity;

20 wherein said nucleic acid molecule selected from the group consisting of (b) and (c) encodes a protein that elicits an immune response against a Flt-3 ligand protein having an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:44, and SEQ ID NO:49, or a protein that has Flt-3 ligand activity;

wherein said nucleic acid molecule selected from the group consisting of (d) and (e) encodes a protein that elicits an immune response against a CD40 protein having an amino acid sequence selected from the group consisting of SEQ ID NO:53, SEQ ID NO:58, and SEQ ID NO:61, or a protein that has CD40 activity;

5 wherein said nucleic acid molecule selected from the group consisting of (f) and (g) encodes a protein that elicits an immune response against a CD154 protein having an amino acid sequence selected from the group consisting of SEQ ID NO:65, SEQ ID NO:70, SEQ ID NO:73, and SEQ ID NO:78, or a protein that has CD154 activity;

10 wherein said nucleic acid molecule of (h) encodes a protein that elicits an immune response against an IL-5 protein having an amino acid sequence selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86, or a protein that has IL-5 activity;

15 wherein said nucleic acid molecule of (i) encodes a protein that elicits an immune response against an IL-13 protein having an amino acid sequence selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105, or a protein that has IL-13 activity;

20 wherein said nucleic acid molecule of (j) encodes a protein that elicits an immune response against an interferon alpha protein having an amino acid sequence selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171; and

wherein said nucleic acid molecule of (k) encodes a protein that elicits an immune response against a GM-CSF protein having an amino acid sequence selected from the group consisting of SEQ ID NO:120 and SEQ ID NO:125.

4. The nucleic acid molecule of Claim 1, wherein said nucleic acid molecule comprises a nucleic acid molecule selected from the group consisting of nCaIL-4₅₄₉, nCaIL-4₃₉₆, nCaIL-4₃₂₄, nCaFlt3L₁₀₁₃, nCaFlt3L₈₈₂, nCaFlt3L₈₀₄, nCaFlt3L₈₂₈, nCaFlt3L₉₈₅, nCaFlt3L₁₀₁₉, nCaFlt3L₉₃, nCaFlt3L₇₅₀, nFeFlt3L₃₉₅, nFeFlt3L₇₉₃, nFeFlt3L₉₄₂, nFeFlt3L₈₇₃,

5 nFeFlt3L₇₉₅, nCaCD40₃₂₁, nCaCD40₁₄₂₅, nCaCD40₈₂₂, nCaCD40₇₆₅, nFeCD40₃₃₆, nCaCD154₃₉₀, nCaCD154₁₈₇₈, nCaCD154₇₈₀, nCaCD154₆₃₃, nFeCD154₈₈₅, nFeCD154₇₈₀, nFeCD154₆₃₃, nCaIL-5₆₁₀, nCaIL-5₄₀₂, nCaIL-5₃₄₅, nCaIL-13₁₆₆, nCaIL-13₂₇₂, nCaIL-13₂₇₈, nCaIL-13₁₃₀₂, nCaIL-13₃₉₃, nCaIL-13₃₃₃, nCaIL-13₁₂₆₉, nCaIL-13₃₉₀, nCaIL-13₃₃₀, nFeIFN α _{567a}, nFeIFN α _{567b}, nFeIFN α _{567c}, nFeIFN α _{498a}, nFeIFN α _{498b}, nFeIFN α _{498c},

10 nFeIFN α _{582d}, nFeIFN α _{513d}, nFeIFN α _{567e}, nFeIFN α _{498e}, nFeGMCSF₄₄₄, nFeGMCSF₄₃₂, and nFeGMCSF₃₈₁.

5. The nucleic acid molecule of Claim 1, wherein said nucleic acid molecule is selected from the group consisting of:

(a) a nucleic acid molecule comprising a nucleic acid sequence that

15 encodes a protein having an amino acid sequence selected from the group consisting of

(i) SEQ ID NO:2, SEQ ID NO:20, SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:44, SEQ ID NO:49, SEQ ID NO:53, SEQ ID NO:58, SEQ ID NO:61, SEQ ID NO:65, SEQ ID NO:70, SEQ ID NO:73, SEQ ID NO:78, SEQ ID NO:81, SEQ ID NO:86, SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, SEQ ID NO:105, and

(ii) SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:120, SEQ ID NO:125, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171; and

(b) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule encoding a protein having any of said amino acid sequences of group (a) (i).

6. The nucleic acid molecule of Claim 1, wherein said nucleic acid molecule is selected from the group consisting of:

(a) a nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of

(i) SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:21, SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, SEQ ID NO:37, SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, SEQ ID NO:50, SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, SEQ ID NO:59, SEQ ID NO:60, SEQ ID NO:62, SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69, SEQ ID NO:71, SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76, SEQ ID NO:77, SEQ ID NO:79, SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, SEQ ID NO:87, SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, SEQ ID NO:106, and

(ii) SEQ ID NO:107, SEQ ID NO:109, SEQ ID NO:110, SEQ ID NO:112, SEQ ID NO:113, SEQ ID NO:115, SEQ ID NO:116, SEQ ID NO:118, SEQ ID NO:119, SEQ ID NO:121, SEQ ID NO:122, SEQ ID NO:123, SEQ ID NO:124; SEQ ID NO:126, SEQ ID NO:155, SEQ ID NO:157, SEQ ID NO:158, SEQ ID NO:160, SEQ 5 ID NO:161, SEQ ID NO:163, SEQ ID NO:164, SEQ ID NO:166, SEQ ID NO:167, SEQ ID NO:169, SEQ ID NO:170, and SEQ ID NO:172; and

(b) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule comprising any of said nucleic acid sequences of (a) (i).

7. The nucleic acid molecule of Claim 1, wherein said nucleic acid molecule 10 is an oligonucleotide.

8. A recombinant molecule comprising a nucleic acid molecule as set forth in Claim 1 operatively linked to a transcription control sequence.

9. A recombinant virus comprising a nucleic acid molecule as set forth in Claim 1.

15 10. A recombinant cell comprising a nucleic acid molecule as set forth in Claim 1.

11. An isolated nucleic acid molecule selected from the group consisting of:

- a nucleic acid molecule having a nucleic acid sequence that is at least about 92 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, and SEQ ID NO:21;
- a nucleic acid molecule having a nucleic acid sequence that is at least about 75 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37;
- a nucleic acid molecule having a nucleic acid sequence that is at least about 75 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:50;
- a nucleic acid molecule having a nucleic acid sequence that is at least about 70 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59;
- a nucleic acid molecule having a nucleic acid sequence that is at least about 70 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62;

(f) a nucleic acid molecule having a nucleic acid sequence that is at least about 85 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69, and SEQ ID NO:71;

5 (g) a nucleic acid molecule having a nucleic acid sequence that is at least about 91 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79;

(h) a nucleic acid molecule having a nucleic acid sequence that is at least about 90 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87;

10 (i) a nucleic acid molecule having a nucleic acid sequence that is at least about 65 percent identical to a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106;

15 (j) a nucleic acid molecule having a nucleic acid sequence that is selected from the group consisting of SEQ ID NO:107, SEQ ID NO:109, SEQ ID NO:110, SEQ ID NO:112, SEQ ID NO:113, SEQ ID NO:115, SEQ ID NO:116, SEQ ID NO:118, SEQ ID NO:155, SEQ ID NO:157, SEQ ID NO:158, SEQ ID NO:160, SEQ ID

NO:161, SEQ ID NO:163, SEQ ID NO:164, SEQ ID NO:166, SEQ ID NO:167, SEQ ID NO:169, SEQ ID NO:170, and SEQ ID NO:172; and

(k) a nucleic acid molecule having a nucleic acid sequence that is

selected from the group consisting of SEQ ID NO:119, SEQ ID NO:121, SEQ ID

5 NO:122, SEQ ID NO:123, SEQ ID NO:124, and SEQ ID NO:126.

12. An isolated nucleic acid molecule selected from the group consisting of:

(a) a nucleic acid molecule having a nucleic acid sequence encoding an IL-4 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 85 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20 and (ii) a protein comprising a fragment of at least 20 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20;

(b) a nucleic acid molecule having a nucleic acid sequence encoding a Flt-3 ligand protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 75 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34, and (ii) a protein comprising a fragment of at least 25 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34;

(c) a nucleic acid molecule having a nucleic acid sequence encoding a Flt-3 ligand protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 75 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49 and (ii) a protein comprising a fragment of at least 25 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49;

(d) a nucleic acid molecule having a nucleic acid sequence encoding a CD40 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 70 percent identical to an amino acid sequence selected

from the group consisting of SEQ ID NO:53 and SEQ ID NO:58 and (ii) a protein comprising a fragment of at least 30 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58;

- (e) a nucleic acid molecule having a nucleic acid sequence encoding a 5 CD40 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 60 percent identical to an amino acid sequence comprising SEQ ID NO:61 and (ii) a protein comprising a fragment of at least 20 amino acids of an amino acid sequence comprising SEQ ID NO:61;
- (f) a nucleic acid molecule having a nucleic acid sequence encoding a 10 CD154 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 80 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70, and (ii) a protein comprising a fragment of at least 35 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70;
- (g) a nucleic acid molecule having a nucleic acid sequence encoding a 15 CD154 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 85 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78, and (ii) a protein comprising a fragment of at least 50 amino acids of an amino acid sequence selected from 20 the group consisting of SEQ ID NO:73 and SEQ ID NO:78;
- (h) a nucleic acid molecule having a nucleic acid sequence encoding an IL-5 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 85 percent identical to an amino acid sequence selected

from the group consisting of SEQ ID NO:81 and SEQ ID NO:86 and (ii) a protein comprising a fragment of at least 20 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86;

- (i) a nucleic acid molecule having a nucleic acid sequence encoding 5 an IL-13 protein selected from the group consisting of (i) a protein having an amino acid sequence that is at least about 70 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105 and (ii) a protein comprising a fragment of at least 15 amino acids of an amino acid sequence selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105;
- (j) a nucleic acid molecule having a nucleic acid sequence encoding an interferon alpha protein having an amino acid sequence that is selected from the group consisting of amino acid sequence SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, 15 SEQ ID NO:168, and SEQ ID NO:171;
- (k) a nucleic acid molecule having a nucleic acid sequence encoding a GMCSF protein having an amino acid sequence that is selected from the group consisting of amino acid sequence SEQ ID NO:120, and SEQ ID NO:125; and
- (l) a nucleic acid molecule comprising a complement of any of said 20 nucleic acid molecules as set forth in (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), or (k), wherein said IL-4 protein elicits an immune response against an IL-4 protein selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20 or is a protein with interleukin-4 activity, said Flt-3 ligand protein elicits an immune response against a

Flt-3 ligand protein selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, SEQ ID NO:34, SEQ ID NO:44, and SEQ ID NO:49 or is a protein with Flt-3 ligand activity, said CD40 protein elicits an immune response against a CD40 protein selected from the group consisting of SEQ ID NO:53, SEQ ID 5 NO:58, and SEQ ID NO:61 or is a protein with CD40 activity, said CD154 protein elicits an immune response against a CD154 protein selected from the group consisting of SEQ ID NO:65, SEQ ID NO:70, SEQ ID NO:73, and SEQ ID NO:78 or is a protein with CD154 activity, said IL-5 protein elicits an immune response against a IL-5 protein selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86 or is a protein 10 with IL-5 activity, said IL-13 protein elicits an immune response against an IL-13 protein selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105 or is a protein with IL-13 activity, said interferon alpha protein elicits an immune response against an interferon alpha protein selected from the group 15 consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171 or is a protein with interferon alpha activity, and said GMCSF protein elicits an immune response against a GMCSF protein selected from the group consisting of SEQ ID NO:120 and SEQ ID NO:125 or is a protein with GM-CSF activity.

13. The nucleic acid molecule of Claim 12,
20 wherein said nucleic acid molecule of (a) comprises a nucleic acid sequence that encodes an IL-4 protein;
wherein said nucleic acid molecule of (b) comprises a nucleic acid sequence that encodes a Flt-3 ligand protein;

wherein said nucleic acid molecule of (c) comprises a nucleic acid sequence that encodes a Flt-3 ligand protein;

wherein said nucleic acid molecule of (d) comprises a nucleic acid sequence that encodes a CD40 protein;

5 wherein said nucleic acid molecule of (e) comprises a nucleic acid molecule that encodes a CD40 protein;

wherein said nucleic acid molecule of (f) comprises a nucleic acid molecule that encodes a CD154 protein;

10 wherein said nucleic acid molecule of (g) comprises a nucleic acid molecule that encodes a CD154 protein;

wherein said nucleic acid molecule of (h) comprises a nucleic acid molecule that encodes an IL5 protein;

wherein said nucleic acid molecule of (i) comprises a nucleic acid molecule that encodes an IL-13 protein;

15 wherein said nucleic acid molecule of (j) consists of a nucleic acid molecule that encodes an IFN α protein; and

wherein said nucleic acid molecule of (k) consists of a nucleic acid molecule that encodes a GMCSF protein.

14. The nucleic acid molecule of Claim 12, wherein said nucleic acid molecule is selected from the group consisting of:

(a) (i) a nucleic acid molecule comprising a nucleic acid sequence encoding a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20; and (ii) a nucleic acid molecule

comprising an allelic variant of a nucleic acid molecule encoding a protein having an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20;

(b) (i) a nucleic acid molecule comprising a nucleic acid sequence 5 encoding a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34; and (ii) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule encoding a protein having an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ 10 ID NO:34;

(c) (i) a nucleic acid molecule comprising a nucleic acid sequence encoding a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49; and (ii) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule encoding a protein having an 15 amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49;

(d) (i) a nucleic acid molecule comprising a nucleic acid sequence encoding a protein comprising an amino acid sequence selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58; and (ii) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule encoding a protein having an 20 amino acid sequence selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58;

(e) (i) a nucleic acid molecule comprising a nucleic acid sequence
encoding a protein comprising an amino acid sequence comprising SEQ ID NO:61; and
(ii) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule
encoding a protein having an amino acid sequence comprising SEQ ID NO:61;

5 (f) (i) a nucleic acid molecule comprising a nucleic acid sequence
encoding a protein comprising an amino acid sequence selected from the group consisting
of SEQ ID NO:65 and SEQ ID NO:70; and (ii) a nucleic acid molecule comprising an
allelic variant of a nucleic acid molecule encoding a protein having an amino acid
sequence selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70;

10 (g) (i) a nucleic acid molecule comprising a nucleic acid sequence
encoding a protein comprising an amino acid sequence selected from the group consisting
of SEQ ID NO:73 and SEQ ID NO:78; and (ii) a nucleic acid molecule comprising an
allelic variant of a nucleic acid molecule encoding a protein having an amino acid
sequence selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78;

15 (h) (i) a nucleic acid molecule comprising a nucleic acid sequence
encoding a protein comprising an amino acid sequence selected from the group
consisting of SEQ ID NO:81 and SEQ ID NO:86; and (ii) a nucleic acid molecule
comprising an allelic variant of a nucleic acid molecule encoding a protein having an
amino acid sequence selected from the group consisting of SEQ ID NO:81 and SEQ ID
20 NO:86; and
(i) (i) a nucleic acid molecule comprising a nucleic acid sequence
encoding a protein comprising an amino acid sequence selected from the group consisting

of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105; and (ii) a nucleic acid molecule comprising an allelic variant of a nucleic acid molecule encoding a protein having an amino acid sequence selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105.

5 15. A recombinant molecule comprising a nucleic acid molecule as set forth in
Claim 12 operatively linked to a transcription control sequence.

16. A recombinant virus comprising a nucleic acid molecule as set forth in
Claim 12. 

10 17. A recombinant cell comprising a nucleic acid molecule as set forth in
Claim 12.

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18. An isolated protein selected from the group consisting of:

(a) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 5 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:4, and SEQ ID NO:19; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ 10 ID NO:2 and SEQ ID NO:20,

wherein said isolated protein elicits an immune response against a canine IL-4 protein or has IL-4 activity;

(b) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 15 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:22, SEQ ID NO:25, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:33, and SEQ ID NO:36; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34,

wherein said isolated protein elicits an immune response against a canine Flt-3 ligand protein or has Flt-3 activity;

(c) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:46, and SEQ ID NO:48; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49,

wherein said isolated protein elicits an immune response against a feline Flt-3 ligand protein or has Flt-3 activity;

(d) (i) an isolated protein of at least about 30 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 90 contiguous nucleotide region identical in sequence to a 90 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:55, and SEQ ID NO:57; and

(ii) an isolated protein of at least about 30 amino acids in length, wherein said protein has an at least 30 contiguous amino acid region identical in sequence to a 30 contiguous amino acid region selected from the group consisting of SEQ ID NO:53, and SEQ ID NO:58,

wherein said isolated protein elicits an immune response against a canine CD40 protein or has CD40 activity;

(e) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence comprising SEQ ID NO:60; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region comprising SEQ ID NO:61,

wherein said isolated protein elicits an immune response against a feline CD40 protein or has CD40 activity;

(f) (i) an isolated protein of at least about 35 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 105 contiguous nucleotide region identical in sequence to a 105 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:67, and SEQ ID NO:69; and

(ii) an isolated protein of at least about 35 amino acids in length, wherein said protein has an at least 35 contiguous amino acid region identical in sequence to a 35 contiguous amino acid region selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70,

wherein said isolated protein elicits an immune response against a canine CD154 protein or has CD154 activity;

(g) (i) an isolated protein of at least about 50 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 150 contiguous nucleotide region identical in sequence to a 150 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:75, and SEQ ID NO:77; and

5 (ii) an isolated protein of at least about 50 amino acids in length, wherein said protein has an at least 50 contiguous amino acid region identical in sequence to a 50 contiguous amino acid region selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78,

10 wherein said isolated protein elicits an immune response against a feline CD154 protein or has CD154 activity;

(h) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:83, and SEQ ID NO:85; and

15 (ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86,

20 wherein said isolated protein elicits an immune response against a canine IL-5 protein or has IL-5 activity;

(i) (i) an isolated protein of at least about 15 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:94, SEQ ID NO:96, SEQ ID NO:99, SEQ ID NO:102, and SEQ ID NO:104; and

5 (ii) an isolated protein of at least about 15 amino acids in length, wherein said protein has an at least 15 contiguous amino acid region identical in sequence to a 15 contiguous amino acid region selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105,

10 wherein said isolated protein elicits an immune response against a canine IL-13 protein or has IL-13 activity;

(j) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:107, SEQ ID NO:110, SEQ ID NO:113, SEQ ID NO:116, SEQ ID NO:155, SEQ ID NO:158, SEQ ID NO:161, SEQ ID NO:164, SEQ ID NO:167, and SEQ ID NO:170, and

15 (ii) an isolated protein selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171,

20 wherein said isolated protein elicits an immune response against a feline interferon alpha protein or has interferon alpha activity;

(k) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:119, SEQ ID NO:122, and SEQ ID NO:124, and

(ii) an isolated protein selected from the group consisting of

5 SEQ ID NO:120 and SEQ ID NO:125,

wherein said isolated protein elicits an immune response against a feline GM-CSF or has GM-CSF activity.

19. The protein of Claim 18,

wherein said protein of (a) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20;

wherein said protein of (b) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34;

wherein said protein of (c) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49;

wherein said protein of (d) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58;

and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58;

wherein said protein of (e) is selected from the group consisting of: (i) an amino acid sequence comprising SEQ ID NO:61; and a protein encoded by an allelic variant of a nucleic acid molecule encoding the protein SEQ ID NO:61;

wherein said protein of (f) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70;

wherein said protein of (g) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78;

wherein said protein of (h) is selected from the group consisting of: (i) an amino acid sequence selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86;

→ wherein said protein of (i) is selected from the group consisting of: (i) SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105; and (ii) a protein encoded by an allelic variant of a nucleic acid molecule encoding a protein selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105;

wherein said protein of (j) is selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171; and wherein said protein of (k) is selected from the group consisting of SEQ ID NO:120 and SEQ ID NO:125.

20. An isolated antibody that selectively binds to a protein as set forth in
Claim 18.

21. An isolated protein selected from the group consisting of:

- (a) a protein having an amino acid sequence that is at least about 85 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20;
- 5 (b) a protein having an amino acid sequence that is at least about 75 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34;
- 10 (c) a protein having an amino acid sequence that is at least about 75 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49;
- (d) a protein having an amino acid sequence that is at least about 70 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:53 and SEQ ID NO:58;
- 15 (e) a protein having an amino acid sequence that is at least about 60 percent identical to an amino acid sequence comprising SEQ ID NO:61;
- (f) a protein having an amino acid sequence that is at least about 80 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70;
- 20 (g) a protein having an amino acid sequence that is at least about 85 percent identical to the amino acid sequence SEQ ID NO:73 and SEQ ID NO:78;
- (h) a protein having an amino acid sequence that is at least about 85 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86;

(i) a protein having an amino acid sequence that is at least about 70 percent identical to an amino acid sequence selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105;

(j) a protein having an amino acid sequence selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171; and

(k) a protein having an amino acid sequence selected from the group consisting of SEQ ID NO:120, and SEQ ID NO:125.

10 22. An isolated antibody that selectively binds to a protein as set forth in
Claim 21.

23. A therapeutic composition that, when administered to an animal, regulates an immune response in said animal, said therapeutic composition comprising a therapeutic compound selected from the group consisting of:

a. an isolated protein comprising an immunoregulatory protein, wherein said protein is selected from the group consisting of

(a) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group

10 consisting of SEQ ID NO:1, SEQ ID NO:4, SEQ ID NO:19; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20,

15 wherein said isolated protein elicits an immune response against a canine IL-4 protein or has IL-4 activity;

(b) (i) *A* an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group

20 consisting of SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:22, SEQ ID NO:25, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:33, and SEQ ID NO:36; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34,

5 wherein said isolated protein elicits an immune response against a canine Flt-3 ligand protein or has Flt-3 activity;

(c) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:46, and SEQ ID NO:48; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49,

15 wherein said isolated protein elicits an immune response against a feline Flt-3 ligand protein or has Flt-3 activity;

(d) (i) an isolated protein of at least about 30 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 90 contiguous nucleotide region identical in sequence to a 90 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:55, and SEQ ID NO:57; and

(ii) an isolated protein of at least about 30 amino acids in length, wherein said protein has an at least 30 contiguous amino acid region identical in sequence to a 30 contiguous amino acid region selected from the group consisting of SEQ ID NO:53, SEQ ID NO:58,

5 wherein said isolated protein elicits an immune response against a canine CD40 protein or has CD40 activity;

(e) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 10 60 contiguous nucleotide region of a nucleic acid sequence comprising SEQ ID NO:60; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region comprising the amino acid sequence SEQ 15 ID NO:61,

wherein said isolated protein elicits an immune response against a feline CD40 protein or has CD40 activity; *O*

(f) (i) an isolated protein of at least about 35 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 105 contiguous nucleotide region identical in sequence to a 20 105 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:67, and SEQ ID NO:69; and

(ii) an isolated protein of at least about 35 amino acids in length, wherein said protein has an at least 35 contiguous amino acid region identical in sequence to a 35 contiguous amino acid region selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70,

5 wherein said isolated protein elicits an immune response against a canine CD154 protein or has CD154 activity;

(g) (i) an isolated protein of at least about 50 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 150 contiguous nucleotide region identical in sequence to a

10 150 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:75, and SEQ ID NO:77; and

(ii) an isolated protein of at least about 50 amino acids in length, wherein said protein has an at least 50 contiguous amino acid region identical in sequence to a 50 contiguous amino acid region selected from the group consisting of

15 SEQ ID NO:73 and SEQ ID NO:78,

a

wherein said isolated protein elicits an immune response against a feline CD154 protein or has CD154 activity;

(h) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:83, and SEQ ID NO:85; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86,

5 wherein said isolated protein elicits an immune response against a canine IL-5 protein or has IL-5 activity;

(i) (i) an isolated protein of at least about 15 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 45 contiguous nucleotide region identical in sequence to a

10 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:94, SEQ ID NO:96, SEQ ID NO:99, SEQ ID NO:102, and SEQ ID NO:104; and

15 (ii) an isolated protein of at least about 15 amino acids in length, wherein said protein has an at least 15 contiguous amino acid region identical in sequence to a 15 contiguous amino acid region selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105,

wherein said isolated protein elicits an immune response against a canine IL-13 protein or has IL-13 activity;

(j) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:107, SEQ ID NO:110, SEQ ID NO:113, SEQ ID NO:116, SEQ ID NO:155, SEQ ID NO:158, SEQ ID NO:161, SEQ ID NO:164, SEQ ID NO:167, and SEQ ID NO:170, and

(ii) an isolated protein selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156, SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171,

5 wherein said isolated protein elicits an immune response against a feline interferon alpha protein or has interferon alpha activity; and

(k) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:119, SEQ ID NO:122, and SEQ ID NO:124, and

10 (ii) an isolated protein selected from the group consisting of SEQ ID NO:120 and SEQ ID NO:125,

wherein said isolated protein elicits an immune response against a feline GM-CSF or has GM-CSF activity; *C*

15 b. a mimotope of any of said immunoregulatory proteins;
c. a multimeric form of any of said immunoregulatory proteins;
d. an isolated nucleic acid molecule selected from the group consisting of
(a) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:21 or a homolog thereof, wherein said
20 homolog has an at least 50 contiguous nucleotide region identical in sequence to a 50 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:21;

(b) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37;

(c) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:50, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:50;

(d) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region

identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59;

- (e) an isolated nucleic acid molecule comprising a nucleic acid
- 5 sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62;
- (f) an isolated nucleic acid molecule comprising a nucleic acid
- 10 sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71, or a homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66,
- 15 SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71;
- (g) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79, or a homolog thereof, wherein said homolog has an at least 35 contiguous nucleotide region identical in

20 sequence to a 35 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79;

(h) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87, or a homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87;

5 (i) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106, or a homolog thereof, wherein said homolog has an at least 15 contiguous nucleotide region identical in sequence to a 15 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106;

10 (j) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:107, SEQ ID NO:109, SEQ ID NO:110, SEQ ID NO:112, SEQ ID NO:113, SEQ ID NO:115, SEQ ID NO:116, SEQ ID NO:118, SEQ ID NO:155, SEQ ID NO:157, SEQ ID NO:158, SEQ ID NO:160, SEQ ID

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NO:161, SEQ ID NO:163, SEQ ID NO:164, SEQ ID NO:166, SEQ ID NO:167, SEQ ID NO:169, SEQ ID NO:170, and SEQ ID NO:172; and

(k) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:119, SEQ ID NO:121, SEQ ID NO:122, SEQ ID NO:123, SEQ ID NO:124, and SEQ ID NO:126;

5 e. an antibody that selectively binds to any of said immunoregulatory proteins; and

f. an inhibitor of a immunoregulatory protein activity identified by its ability to inhibit the activity of any of said immunoregulatory proteins.

10 24. The composition of Claim 23, wherein said composition further comprises a component selected from the group consisting of an excipient, an adjuvant and a carrier.

25. The composition of Claim 23, wherein said therapeutic compound is selected from the group consisting of a naked nucleic acid vaccine and a recombinant cell vaccine.

26. A method to regulate an immune response in an animal comprising administering to the animal a therapeutic composition comprising a therapeutic compound selected from the group consisting of:

(a) (i) an isolated protein of at least about 20 amino acids in 5 length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:4, SEQ ID NO:19; and

(ii) an isolated protein of at least about 20 amino acids in 10 length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:2 and SEQ ID NO:20,

wherein said isolated protein elicits an immune response against a canine IL-4 protein or has IL-4 activity;

(b) (i) an isolated protein of at least about 20 amino acids in 15 length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:22, SEQ ID NO:25, SEQ ID 20 NO:28, SEQ ID NO:30, SEQ ID NO:33, and SEQ ID NO:36; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in

sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:7, SEQ ID NO:23, SEQ ID NO:26, SEQ ID NO:31, and SEQ ID NO:34, wherein said isolated protein elicits an immune response against a canine Flt-3 ligand protein or has Flt-3 activity;

5 (c) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:46, and SEQ 10 ID NO:48; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:44 and SEQ ID NO:49,

15 wherein said isolated protein elicits an immune response against a feline Flt-3 ligand protein or has Flt-3 activity; *α*

(d) (i) an isolated protein of at least about 30 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 90 contiguous nucleotide region identical in sequence to a 90 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:55, and SEQ ID NO:57; and

(ii) an isolated protein of at least about 30 amino acids in length, wherein said protein has an at least 30 contiguous amino acid region identical in

sequence to a 30 contiguous amino acid region selected from the group consisting of SEQ ID NO:53, SEQ ID NO:58,

wherein said isolated protein elicits an immune response against a canine CD40 protein or has CD40 activity;

5 (e) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence comprising SEQ ID NO:60; and

10 (ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in sequence to a 20 contiguous amino acid region comprising the amino acid sequence SEQ ID NO:61,

15 wherein said isolated protein elicits an immune response against a feline CD40 protein or has CD40 activity;

(f) (i) an isolated protein of at least about 35 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 105 contiguous nucleotide region identical in sequence to a 105 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:67, and SEQ ID NO:69; and

(ii) an isolated protein of at least about 35 amino acids in length, wherein said protein has an at least 35 contiguous amino acid region identical in

sequence to a 35 contiguous amino acid region selected from the group consisting of SEQ ID NO:65 and SEQ ID NO:70,

wherein said isolated protein elicits an immune response against a canine CD154 protein or has CD154 activity;

5 (g) (i) an isolated protein of at least about 50 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 150 contiguous nucleotide region identical in sequence to a 150 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:75, and SEQ ID NO:77; and

10 (ii) an isolated protein of at least about 50 amino acids in length, wherein said protein has an at least 50 contiguous amino acid region identical in sequence to a 50 contiguous amino acid region selected from the group consisting of SEQ ID NO:73 and SEQ ID NO:78,

15 wherein said isolated protein elicits an immune response against a feline CD154 protein or has CD154 activity;

(h) (i) an isolated protein of at least about 20 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 60 contiguous nucleotide region identical in sequence to a 60 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:83, and SEQ ID NO:85; and

(ii) an isolated protein of at least about 20 amino acids in length, wherein said protein has an at least 20 contiguous amino acid region identical in

sequence to a 20 contiguous amino acid region selected from the group consisting of SEQ ID NO:81 and SEQ ID NO:86,

wherein said isolated protein elicits an immune response against a canine IL-5 protein or has IL-5 activity;

5 (i) (i) an isolated protein of at least about 15 amino acids in length, wherein said protein is encoded by a nucleic acid molecule, wherein said nucleic acid molecule has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID

10 NO:94, SEQ ID NO:96, SEQ ID NO:99, SEQ ID NO:102, and SEQ ID NO:104; and

(ii) an isolated protein of at least about 15 amino acids in length, wherein said protein has an at least 15 contiguous amino acid region identical in sequence to a 15 contiguous amino acid region selected from the group consisting of SEQ ID NO:92, SEQ ID NO:97, SEQ ID NO:100, and SEQ ID NO:105,

15 wherein said isolated protein elicits an immune response against a canine IL-13 protein or has IL-13 activity;

(j) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:107, SEQ ID NO:110, SEQ ID NO:113, SEQ ID NO:116, SEQ ID NO:155, SEQ ID NO:158, SEQ ID NO:161, SEQ ID

20 NO:164, SEQ ID NO:167, and SEQ ID NO:170, and

(ii) an isolated protein selected from the group consisting of SEQ ID NO:108, SEQ ID NO:111, SEQ ID NO:114, SEQ ID NO:117, SEQ ID NO:156,

SEQ ID NO:159, SEQ ID NO:162, SEQ ID NO:165, SEQ ID NO:168, and SEQ ID NO:171,

wherein said isolated protein elicits an immune response against a feline interferon alpha protein or has interferon alpha activity; and

5 (k) (i) an isolated protein encoded by a nucleic acid molecule selected from the group consisting of SEQ ID NO:119, SEQ ID NO:122, and SEQ ID NO:124, and

(ii) an isolated protein selected from the group consisting of SEQ ID NO:120 and SEQ ID NO:125,

10 wherein said isolated protein elicits an immune response against a feline GM-CSF or has GM-CSF activity;

- b. a mimetope of any of said immunoregulatory proteins;
- c. a multimeric form of any of said immunoregulatory proteins;
- d. an isolated nucleic acid molecule selected from the group consisting of

15 (a) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:21 or a homolog thereof, wherein said homolog has an at least 50 contiguous nucleotide region identical in sequence to a 50 contiguous nucleotide region of a nucleic acid sequence selected from the group

20 consisting of SEQ ID NO:1, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:19, SEQ ID NO:21;

(b) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID

NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region identical in sequence to a 40

5 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:24, SEQ ID NO:25, SEQ ID NO:27, SEQ ID NO:28, SEQ ID NO:29, SEQ ID NO:30, SEQ ID NO:32, SEQ ID NO:33, SEQ ID NO:35, SEQ ID NO:36, and SEQ ID NO:37;

10 (c) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:50, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:45, SEQ ID NO:46, SEQ ID NO:47, SEQ ID NO:48, and SEQ ID NO:50;

15 (d) *a* an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59, or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence

selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:54, SEQ ID NO:55, SEQ ID NO:56, SEQ ID NO:57, and SEQ ID NO:59;

(e) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62, or a
5 homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region
identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence
selected from the group consisting of SEQ ID NO:60 and SEQ ID NO:62;

(f) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID
10 NO:66, SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71, or a
homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region
identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence
selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:66,
SEQ ID NO:67, SEQ ID NO:68, SEQ ID NO:69 and SEQ ID NO:71;

15 (g) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID
NO:75, SEQ ID NO:76, SEQ ID NO:77, and SEQ ID NO:79, or a homolog thereof,
20 ^a wherein said homolog has an at least 35 contiguous nucleotide region identical in
sequence to a 35 contiguous nucleotide region of a nucleic acid sequence selected from
the group consisting of SEQ ID NO:72, SEQ ID NO:74, SEQ ID NO:75, SEQ ID NO:76,
SEQ ID NO:77, and SEQ ID NO:79;

(h) an isolated nucleic acid molecule comprising a nucleic acid

sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID

NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87, or a homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:82, SEQ ID NO:83, SEQ ID NO:84, SEQ ID NO:85, and SEQ ID NO:87;

(i) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106, or a homolog thereof, wherein said homolog has an at least 15 contiguous nucleotide region identical in sequence to a 15 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:93, SEQ ID NO:94, SEQ ID NO:95, SEQ ID NO:96, SEQ ID NO:98, SEQ ID NO:99, SEQ ID NO:101, SEQ ID NO:102, SEQ ID NO:103, SEQ ID NO:104, and SEQ ID NO:106;

(j) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:107, SEQ ID NO:109, SEQ ID NO:110, SEQ ID NO:112, SEQ ID NO:113, SEQ ID NO:115, SEQ ID NO:116, SEQ ID NO:118, SEQ ID NO:155, SEQ ID NO:157, SEQ ID NO:158, SEQ ID NO:160, SEQ ID NO:161, SEQ ID NO:163, SEQ ID NO:164, SEQ ID NO:166, SEQ ID NO:167, SEQ ID NO:169, SEQ ID NO:170 and SEQ ID NO:172; and

(k) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:119, SEQ ID NO:121, SEQ ID NO:122, SEQ ID NO:123, SEQ ID NO:124, and SEQ ID NO:126;

5 e. an antibody that selectively binds to any of said immunoregulatory proteins; and

f. an inhibitor of a immunoregulatory protein activity identified by its ability to inhibit the activity of any of said immunoregulatory proteins.

27. The method of Claim 26, wherein said animal is selected from the group consisting of canids and felids. *A*

10 28. The method of Claim 26, wherein said composition further comprises a component selected from the group consisting of an excipient, an adjuvant and a carrier.

29. The method of Claim 26, wherein said protective compound is selected from the group consisting of a naked nucleic acid vaccine and a recombinant cell vaccine.

30. A method to produce an immunoregulatory protein, said method comprising culturing a cell capable of expressing said protein, said protein being encoded by a nucleic acid molecule selected from the group consisting of

(a) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:4, and SEQ ID NO:19, or a homolog thereof, wherein said homolog has an at least 50 contiguous nucleotide region identical in sequence to a 50 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:4, and SEQ ID NO:19;

(b) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:22, SEQ ID NO:25, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:33, and SEQ ID NO:36 or a homolog thereof, wherein said homolog has an at least 40 contiguous nucleotide region identical in sequence to a contiguous nucleotide region of a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:9, SEQ ID NO:22, SEQ ID NO:25, SEQ ID NO:28, SEQ ID NO:30, SEQ ID NO:33, and SEQ ID NO:36;

(c) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:46, and SEQ ID NO:48, or a homolog thereof, wherein said homolog has an at least 30 contiguous nucleotide region identical in sequence to a contiguous nucleotide region of a 30 contiguous nucleotide region of a nucleic acid sequence selected

from the group consisting of SEQ ID NO:41, SEQ ID NO:42, SEQ ID NO:43, SEQ ID NO:46, and SEQ ID NO:48;

- (d) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:55, and SEQ ID NO:57, or a homolog thereof, wherein said homolog has an at least 5 40 contiguous nucleotide region identical in sequence to a 40 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:51, SEQ ID NO:52, SEQ ID NO:55, and SEQ ID NO:57;
- (e) an isolated nucleic acid molecule comprising a nucleic acid sequence comprising SEQ ID NO:60, or a homolog thereof, wherein said homolog has an at least 10 30 contiguous nucleotide region identical in sequence to a 30 contiguous nucleotide region of a nucleic acid sequence comprising SEQ ID NO:60;
- (f) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:67, and SEQ ID NO:69 or a homolog thereof, wherein said homolog has an at least 15 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:63, SEQ ID NO:64, SEQ ID NO:67, and SEQ ID NO:69;
- (g) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:75, and SEQ ID NO:77 or a homolog thereof, wherein said homolog has an at least 20 35 contiguous nucleotide region identical in sequence to a 35 contiguous nucleotide region of a nucleic

acid sequence selected from the group consisting of SEQ ID NO:72, SEQ ID NO:75, and SEQ ID NO:77;

(h) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:83, and SEQ 5 ID NO:85, or a homolog thereof, wherein said homolog has an at least 45 contiguous nucleotide region identical in sequence to a 45 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:80, SEQ ID NO:83, and SEQ ID NO:85;

(i) an isolated nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, SEQ ID NO:89, SEQ ID 10 NO:90, SEQ ID NO:91, SEQ ID NO:94, SEQ ID NO:96, SEQ ID NO:99, SEQ ID NO:102, and SEQ ID NO:104, or a homolog thereof, wherein said homolog has an at least 15 contiguous nucleotide region identical in sequence to a 15 contiguous nucleotide region of a nucleic acid sequence selected from the group consisting of SEQ ID NO:88, 15 SEQ ID NO:89, SEQ ID NO:90, SEQ ID NO:91, SEQ ID NO:94, SEQ ID NO:96, SEQ ID NO:99, SEQ ID NO:102, and SEQ ID NO:104;

(j) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:107, SEQ ID NO:110, SEQ ID 20 NO:113, SEQ ID NO:116, SEQ ID NO:155, SEQ ID NO:158, SEQ ID NO:161, SEQ ID NO:164, SEQ ID NO:167, and SEQ ID NO:170; and

(k) an isolated nucleic acid molecule having a nucleic acid sequence selected from the group consisting of SEQ ID NO:119, SEQ ID NO:122, and SEQ ID NO:124.

31. The method of Claim 30, wherein said cell expresses a nucleic acid molecule selected from the group consisting of nCaIL-4₅₄₉, nCaIL-4₃₉₆, nCaIL-4₃₂₄, nCaFlt3L₁₀₁₃, nCaFlt3L₈₈₂, nCaFlt3L₈₀₄, nCaFlt3L₈₂₈, nCaFlt3L₉₈₅, nCaFlt3L₁₀₁₉, nCaFlt3L₉₃, nCaFlt3L₇₅₀, nFeFlt3L₃₉₅, nFeFlt3L₇₉₃, nFeFlt3L₉₄₂, nFeFlt3L₈₇₃, nFeFlt3L₇₉₅,

5 nCaCD40₃₂₁, nCaCD40₁₄₂₅, nCaCD40₈₂₂, nCaCD40₇₆₅, nFeCD40₃₃₆, nCaCD154₃₉₀, nCaCD154₁₈₇₈, nCaCD154₇₈₀, nCaCD154₆₃₃, nFeCD154₈₈₅, nFeCD154₇₈₀, nFeCD154₆₃₃, nCaIL-5₆₁₀, nCaIL-5₄₀₂, nCaIL-5₃₄₅, nCaIL-13₁₆₆, nCaIL-13₂₇₂, nCaIL-13₂₇₈, nCaIL-13₁₃₀₂, nCaIL-13₃₉₃, nCaIL-13₃₃₃, nCaIL-13₁₂₆₉, nCaIL-13₃₉₀, nCaIL-13₃₃₀, nFeIFN α _{567a}, nFeIFN α _{567b}, nFeIFN α _{567c}, nFeIFN α _{498a}, nFeIFN α _{498b}, nFeIFN α _{498c}, nFeIFN α _{582d},

10 nFeIFN α _{513d}, nFeIFN α _{567e}, nFeIFN α _{498e}, nFeGMCSF₄₄₄, nFeGMCSF₄₃₂, and nFeGMCSF₃₈₁.

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32. A method to identify a compound capable of regulating an immune response in an animal, said method comprising:

5 (a) contacting an isolated canine IL-4 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has T cell proliferation stimulating activity; and determining if said putative inhibitory compound inhibits said activity;

10 (b) contacting an isolated canine Flt-3 ligand protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has dendritic precursor cell proliferation stimulating activity; and determining if said putative inhibitory compound inhibits said activity;

15 (c) contacting an isolated feline Flt-3 ligand protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has dendritic precursor cell proliferation stimulating activity; and determining if said putative inhibitory compound inhibits said activity;

20 (d) contacting an isolated canine CD40 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has CD40 ligand binding activity; and determining if said putative inhibitory compound inhibits said activity;

(e) contacting an isolated feline CD40 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has CD40 ligand binding activity; and determining if said putative inhibitory compound inhibits said activity;

(f) contacting an isolated canine CD154 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has B cell proliferation activity; and determining if said putative inhibitory compound inhibits said activity;

5 (g) contacting an isolated feline CD154 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has B cell proliferation activity; and determining if said putative inhibitory compound inhibits said activity;

(h) contacting an isolated canine IL-5 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has TF-1 cell proliferation activity; and determining if said putative inhibitory compound inhibits said activity;

10 (i) contacting an isolated canine IL-13 protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has TF-1 cell proliferation activity; and determining if said putative inhibitory compound inhibits said activity;

15 (j) contacting an isolated feline IFN α protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said protein has inhibition of proliferation of GM-CSF stimulated TF-1 cell activity; and determining if said putative inhibitory compound inhibits said activity; or

20 (k) contacting an isolated feline GMCSF protein with a putative inhibitory compound under conditions in which, in the absence of said compound, said

protein has TF-1 cell proliferation activity; and determining if said putative inhibitory compound inhibits said activity.

Add a)